

Application Serial No: 10/562,550
Responsive to the Office Action mailed on: October 2, 2008

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IN THE CLAIMS

Amendments To The Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An ultrasonic diagnostic apparatus, comprising:
 - transmission means for transmitting at least one ultrasonic signal from a surface of a skin of a subject toward a blood vessel of the subject;
 - reception means for receiving an ultrasonic echo reflected by the blood vessel and converting the ultrasonic echo into an electric signal to obtain the ultrasonic echo signal in a depth direction from the surface of the skin;
 - movement detection means for analyzing a phase of the ultrasonic echo signal in a direction traversing the blood vessel to calculate a movement amount ~~in each of a plurality of regions including a blood vessel wall composing the blood vessel and a vicinity of the blood vessel wall~~;
 - analysis means for analyzing a state of the blood vessel based on a difference of a track of variation in the calculated movement amount of the blood vessel wall whose movement amount was calculated with respect to time; in each of the regions;
 - boundary position detection means for detecting a boundary position between a blood flow region and the blood vessel wall of the blood vessel based on a result of the analysis by the analysis means; and
 - stability judgment means for comparing the boundary position detected by the boundary position detection means with a detection result in a previous heartbeat cycle, thereby judging stability of a measurement state.
2. (Original) The ultrasonic diagnostic apparatus according to claim 1, further comprising an ROI (Region of Interest) positioning means for positioning an ROI where the boundary position in the depth direction from the surface of the skin is to be detected by the boundary position detection means,

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wherein the ROI positioning means positions the ROI so that the ROI lies astride at least one of an anterior wall of the blood vessel wall on a side closer to the transmission means and a posterior wall of the blood vessel wall on a side farther from the transmission means.

3. (Currently Amended) ~~The~~ An ultrasonic diagnostic apparatus, comprising:
~~according to claim 1, wherein the~~

a transmission means for transmitting transmits a plurality of ultrasonic signals from a surface of a skin of a subject toward a plurality of regions in a longitudinal direction of the a blood vessel of the subject;[[,]]

a reception means for receiving an ultrasonic echo reflected by the blood vessel and converting the ultrasonic echo into an electrical signal to obtain the ultrasonic echo signal in a depth direction from the surface of the skin;

~~the a~~ boundary position detection means for detecting a detects the plurality of boundary positions in the longitudinal direction of the blood vessel;[[,]] and

~~the a~~ stability judgment means for comparing compares the plurality of boundary positions detected by the boundary position detection means, thereby judging stability of a measurement state ~~result of the detection of the boundary positions.~~

4. (Previously Amended) The ultrasonic diagnostic apparatus according to claim 1, wherein the boundary position detection means detects the plurality of boundary positions in the depth direction from the surface of the skin,

the apparatus further comprising a blood vessel diameter calculation means for calculating a diameter of the blood vessel based on the plurality of detected boundary positions.

5. (Currently Amended) The ultrasonic diagnostic apparatus according to claim 4, wherein the stability judgment means further compares the diameter of the blood vessel calculated by the blood vessel diameter calculation means with a calculation result in a previous cycle, thereby judging stability of a measurement state ~~result of the detection of the boundary positions.~~

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6. (Previously Presented) The ultrasonic diagnostic apparatus according to claim 1, wherein the boundary position detection means detects the boundary positions in the plurality of regions in the longitudinal direction of the blood vessel,

the apparatus further comprising a pulse wave propagation speed calculation means for calculating a pulse wave propagation speed indicating a speed at which a pulse wave propagates, based on a variation with time in the plurality of boundary positions detected by the boundary position detection means.

7. (Currently Amended) The ultrasonic diagnostic apparatus according to claim 6, wherein the stability judgment means further compares the pulse wave propagation speed calculated by the pulse wave propagation speed calculation means with the pulse wave propagation speed calculated in a previous cycle, thereby judging stability of a result of the calculation of the pulse wave propagation speed.

8. (Currently Amended) The ultrasonic diagnostic apparatus according to claim 6, wherein the pulse wave propagation speed calculation means further calculates pulse wave propagation speeds in a plurality of adjacent regions in the longitudinal direction of the blood vessel, and the stability judgment means compares the pulse wave propagation speeds in the plurality of adjacent regions, thereby judging stability of a measurement state.
~~result of the calculation of the pulse wave propagation speeds.~~

9. (Currently Amended) The ultrasonic diagnostic apparatus according to claim 1, wherein the boundary position detection means detects a boundary position between a tunica intima and the blood flow region of the blood vessel and a position of a tunica media of the blood vessel based on a hardness value of tissue in the depth direction, and the stability judgment means compares the boundary position and the position of the tunica media detected by the boundary position detection means with the boundary position and the position of the tunica media calculated a predetermined number or more of cycles prior to the present cycle, thereby judging stability of a measurement state.
~~result of the detection of the boundary position and the position of the tunica media.~~

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10. (Currently Amended) The ultrasonic diagnostic apparatus according to claim 1, wherein the transmission means transmits a plurality of ultrasonic signals toward a plurality of regions in the longitudinal direction of the blood vessel, the boundary position detection means detects the boundary positions between the tunica intima and the blood flow region of the blood vessel and the positions of the tunica media of the blood vessel in a plurality of regions adjacent to each other in the longitudinal direction of the blood vessel, and the stability judgment means compares the boundary positions and the positions of the tunica media adjacent to each other that are detected by the boundary position detection means, thereby judging stability of a measurement state.~~‡~~

11. (Currently Amended) The ultrasonic diagnostic apparatus according to claim 1, further comprising an IMT (Intima-Media Thickness) calculation means for measuring an IMT, which is a thickness from the tunica intima to the tunica media, based on a variation with time in the boundary position between the tunica intima and the blood flow region of the blood vessel and a variation with time in the position of the tunica media of the blood vessel,

wherein the stability judgment means judges stability of a measurement state ~~result of the detection of the boundary position by the boundary position detection means~~ based on the IMT measured by the IMT calculation means.

12. (Currently Amended) The ultrasonic diagnostic apparatus according to claim 11, wherein the IMT calculation means calculates the IMT values in a plurality of regions adjacent to each other in the longitudinal direction of the blood vessel, and the stability judgment means compares the IMT values in the plurality of regions, thereby judging stability of a measurement state.~~result of the detection of the boundary position by the boundary position detection means.~~

13. (Previously Presented) The ultrasonic diagnostic apparatus according to claim 1, further comprising display means for displaying the stability judged by the stability judgment means.

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14. (New) The ultrasonic diagnostic apparatus according to claim 3, wherein the boundary position detection means detects a boundary position between a tunica intima and a blood flow region of the blood vessel and a position of a tunica media of the blood vessel based on a hardness value of tissue in the depth direction, and the stability judgment means compares the boundary position and the position of the tunica media detected by the boundary position detection means with the boundary position and the position of the tunica media calculated a predetermined number or more of cycles prior to the present cycle, thereby judging stability of a measurement state.

15. (New) The ultrasonic diagnostic apparatus according to claim 3, wherein the boundary position detection means detects boundary positions between a tunica intima and a blood flow region of the blood vessel and positions of a tunica media of the blood vessel in a plurality of regions adjacent to each other in the longitudinal direction of the blood vessel, and the stability judgment means compares the boundary positions and the positions of the tunica media adjacent to each other that are detected by the boundary position detection means, thereby judging stability of a measurement result.

16. (New) The ultrasonic diagnostic apparatus according to claim 3, further comprising an IMT (Intima-Media Thickness) calculation means for measuring an IMT, which is a thickness from a tunica intima to a tunica media, based on a variation with time in a boundary position between the tunica intima and a blood flow region of the blood vessel and a variation with time in a position of the tunica media of the blood vessel,

wherein the stability judgment means judges stability of a measurement state based on the IMT measured by the IMT calculation means.

17. (New) The ultrasonic diagnostic apparatus according to claim 16, wherein the IMT calculation means calculates IMT values in a plurality of regions adjacent to each other in the longitudinal direction of the blood vessel, and the stability judgment means compares the IMT values in the plurality of regions, thereby judging stability of a measurement state.

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18. (New) The ultrasonic diagnostic apparatus according to claim 3, further comprising display means for displaying the stability judged by the stability judgment means.